1970

Spring 1970

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TURF BULLETIN

MASSACHUSETTS TURF AND LAWN GRASS COUNCIL
INCORPORATED

SPRING 1970

BETTER TURF THROUGH RESEARCH AND EDUCATION

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Vol. 6, No. 1 **Spring 1970**

The Massachusetts Turf and Lawn Grass Council Incorporated is chartered under the laws of the Commonwealth of Massachusetts as a non-profit corporation. The turf council seeks to foster "Better turf through research and education".

More detailed information on the subjects discussed here can be found in bulletins and circulars or may be had through correspondence with the editor.

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—Reprinted from
THE SULPHUR INSTITUTE Vol. 5, No. 3

Response of COASTAL BERMUDAGRASS to Nitrogen in Sulphur-Coated Urea, Urea and Ammonium Nitrate

D. A. MAYS AND G. L. TERMAN
Tennessee Valley Authority
Muscle Shoals, Alabama

■ WHEN FORAGE GRASSES are fertilized with ammonium nitrate, urea, or other soluble nitrogen sources the response is characterized by rapid growth and excessive N uptake soon after fertilization, followed by N deficiency in a few weeks. Organic materials such as sewage sludge, oil seed meals and urea formaldehyde which release N over an extended period of time are too expensive for use on forages.

In recent years several research workers have coated soluble fertilizers with a number of materials including plastic (3, 4), asphalt, and waxes in an effort to develop slow release N fertilizers at reasonable cost. The Applied Research Branch of the Tennessee Valley Authority has developed a coated urea product (2, 6) using elemental sulphur and wax which combines satisfactory slow release characteristics with reasonable cost.

The research reported here was conducted to measure the growth responses of Coastal bermudagrass (*Cynodon dactylon*) following fertilization with TVA sulphur-coated urea (SCU), uncoated urea (UCU), and ammonium nitrate (AN).

An experiment was conducted from 1966 to 1969 at Muscle Shoals, Alabama, on a well established Coastal bermudagrass sod. The experiment included three replications of all combinations of the treatments shown in Table 1 plus a check receiving no N.

Table 1
SUMMARY OF EXPERIMENTAL TREATMENTS

N Source and Analysis		N applied, kg/ha	Application times
AN	33.5-0-0	224	all in early April
UCU	45.9-0-0	448	½ in April and ½ after second cut
SCU	26.1-0-0-40S	—	¼ in April and ½ after each of first 3 cuts

This work was done with SCU manufactured several years ago when heavy (40 to 45%) coatings were thought necessary for adequate reduction of dissolution rates. Newer coating techniques plus the addition of a microbicide have made it possible to reduce coatings to the 20 to 25% level, thus reducing costs and raising the analysis of the finished product to 35 to 38% N.

The soil was Sango silty clay loam which had initial P and K levels of 330 and 450 kg/ha respectively. Maintenance levels of P and K were applied annually in the fall. The entire experimental area was surface limed with 6.7 ton/ha of dolomitic limestone the fall before starting the experiment, when the soil pH was 4.9 to 5.0. Each year the experimental area was burned over about March 1 to destroy winter weeds and disease organisms, then sprayed with Dacthal or Simazine to control crabgrass.

The 1.5 x 7.0 m plots were harvested four times annually in 1966-'67 and '68. The approximate harvest dates were June 5, July 10, August 20 and September 20. In 1969 no fertilizer was applied and a harvest to measure residual N effects was taken on June 9.

After the cut green forage was weighed, subsamples were taken for dry matter determination and later analyzed for N content. All yield and N uptake data were statistically analyzed by multiple regression techniques (5).

Response of Coastal bermudagrass to these N sources varied with the application schedule and year of application. In 1966 (Figure 1) all three N sources produced comparable yields of forage when applied once or twice annually. With four applications SCU produced significantly less forage than the soluble sources, probably because the delay in dissolution

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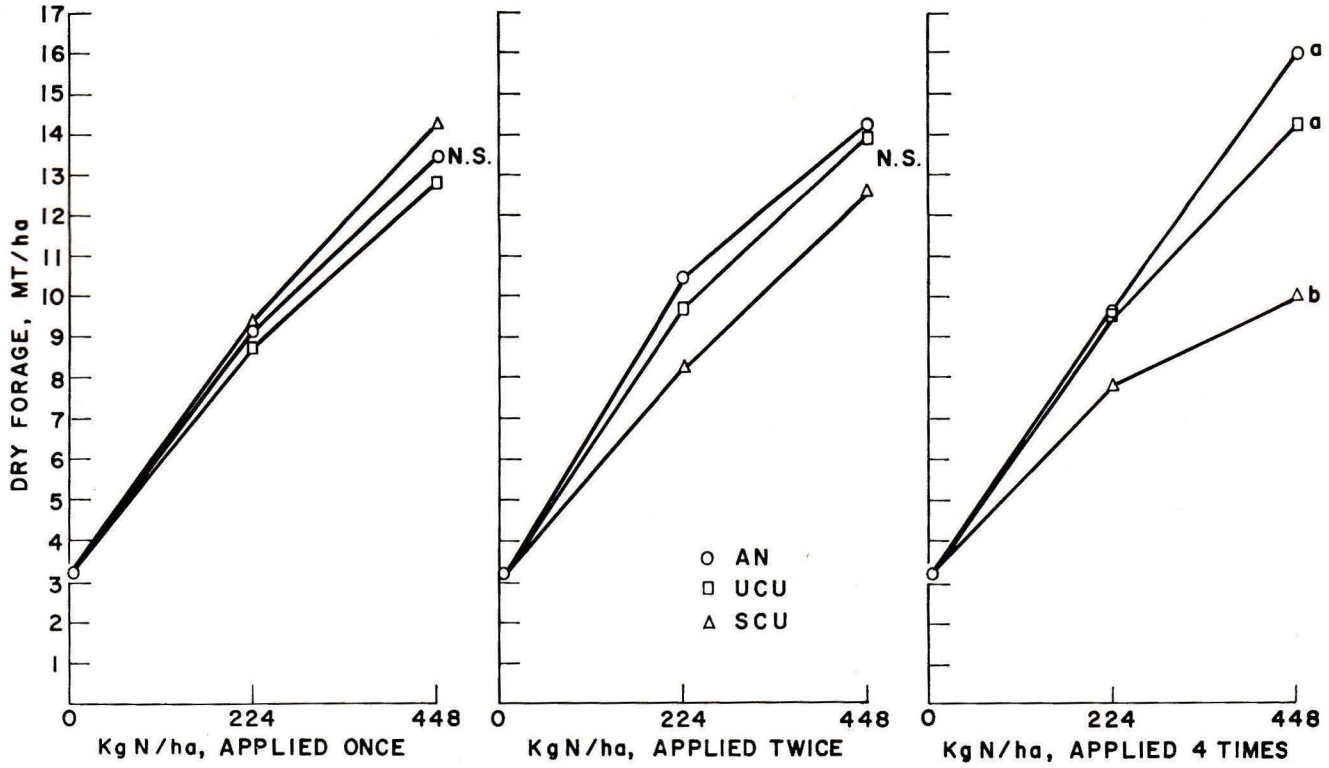


Fig. 1 Yield of Coastal bermudagrass forage in 1966.

(Continued from Page 3)

resulted in a net reduction in the amount of N available to the plants during the most favorable part of the growing season. A comparison of application schedules for individual N sources shows that yields from AN and UCU tended to increase slightly with more applications, while yields from SCU were markedly less with four applications.

Figure 2 shows that yield responses were quite different in 1967 than in 1966. The highest yields following all application schedules were obtained from SCU-fertilized plots, the difference being greatest with four applications. This indicates a significant recovery of the N that remained in the soil after the 1966 season. This appeared to be carried over winter as soil N or crop residues and not as undissolved SCU granules, since no intact granules were found.

The lowest yields were obtained from UCU-fertilized plots, with the difference between AN and UCU being greatest following the single application. As in 1966, yields from AN and UCU tended to increase slightly with a greater number of applications.

The 1968 yield results were similar to those shown for 1967 and again pointed to a significant carry over of N in plots fertilized four times annually with SCU.

Although the three year average yield data are not shown, there were no significant differences among any of the materials applied two or four times annually. However, UCU produced significantly less forage than AN or SCU when all were applied as single spring applications.

One of the primary advantages of a slow release N source is in producing fairly uniform growth over a long period of time from a single application of fertilizer. Figure 3 shows cumulative forage yields in 1966 following single and split applications of AN and SCU at annual N rates of 224 kg/ha. Note that a single spring application of AN resulted in more than half the total forage being removed at the first harvest. A single spring application of SCU resulted in the same type of uniform seasonal distribution as four applications of AN. Split applications of SCU released N too slowly for maximum growth in 1966. However, in later years when some residual N was present split SCU also resulted in uniform yield distribution curves.

Apparent N recovery (Table 2) showed the same general relationship as total yields. However, regres-

Table 2

APPARENT NITROGEN RECOVERY, 3 YEAR AVERAGE

N applied kg/ha	No. of Applications	N recovery, % AN	UCU	SCU
224	1	61	52	70
—	2	64	56	59
—	4	55	53	55
448	1	67	48	66
—	2	64	52	56
—	4	65	48	57

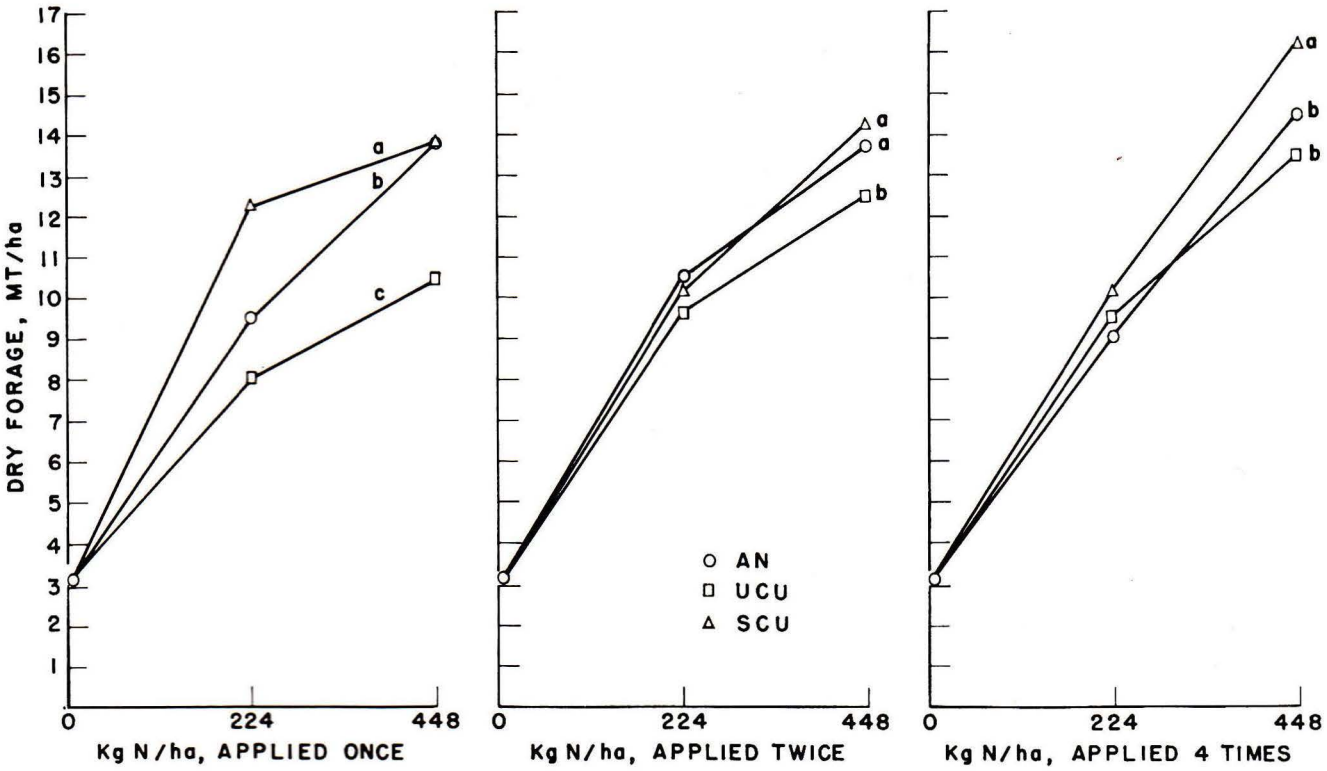
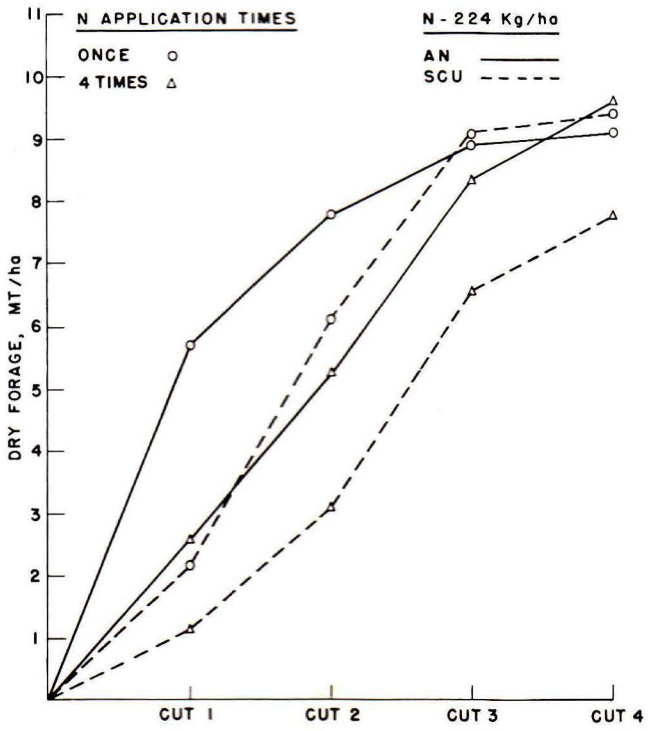


Fig. 2 Yield of Coastal bermudagrass forage in 1967.

sion analysis showed more significant differences among N sources than were shown by the yield data in Figures 1 and 2. Note that N recovery from SCU was much higher from single than from multiple applications. This same trend was true to a lesser extent with AN but not with UCU. The lower N recovery from UCU reflects the generally lower yields from this source and also slightly lower N contents in the forage.

Fig. 3 Effect of N source on cumulative forage yield in 1966.



Soil pH and sodium bicarbonate extractable S were measured in the fall of 1968. Table 3 shows that there was little difference in soil pH following any of the treatments, even though more than 700 kg/ha of S was added annually at the high rate of SCU. However, SCU increased the soil S level over the three year period. The soil sulphur states are considered adequate on this site, as approximately 22 kg/ha annually is added to the soil from atmospheric industrial sources.

Figure 4 shows the influence of residual soil N on yields of bermudagrass harvested in June 1969. Highest yields were obtained from SCU following all application schedules. The differences between SCU and AN were significant at the 10% but not at the 5% level following two and four applications, while UCU resulted in significantly less yield than SCU in all instances. These data tend to confirm that plots fertilized with SCU yielded more in 1967 and 1968 than in 1966 relative to AN and UCU, because of greater carry over of residual N in the soil.

The foregoing data clearly show that SCU has satisfactory agronomic properties for use on Coastal bermudagrass, a warm-season species. Earlier papers (1, 6) have shown its usefulness for tall fescue, a cool-season species.

SCU has the following advantages for use on Coastal bermudagrass:

(Continued on Page 6)

Table 3

EFFECT OF NITROGEN SOURCE AND RATES (ONE APPLICATION ANNUALLY) ON SOIL pH AND SULPHUR LEVEL

N Source	N Rate kg/ha	pH 2.5-15 cm	pH 15-30 cm	Extractable S, kg/ha 2.15-15 cm	Extractable S, kg/ha 15-30 cm
AN	224	5.0	5.0	34	47
	448	4.8	5.1	40	60
UCU	224	4.9	5.1	34	50
	448	4.8	5.0	41	52
SCU	224	5.0	5.0	140	185
	448	4.8	4.8	161	224
No N	0	5.1	4.9	36	59

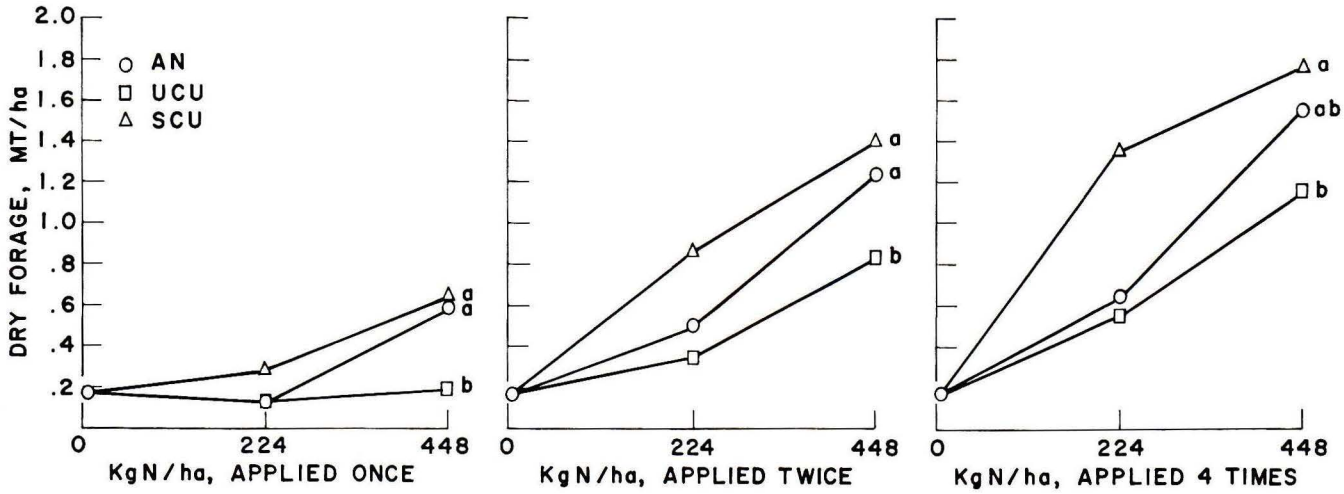


Fig. 4 Residual yield of Coastal bermudagrass forage in 1969.

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1. Single spring applications give total forage yields and seasonal distribution as good as more resulting from the same amount of total N in four applications of AN.
2. Excess early production of lush forage with unnecessarily high N content is avoided.
3. The S added by SCU is effective in increasing soil sulphur levels.
4. Sulphur-coating appears to make it possible to use urea for surface application on sod crops without foliage burning or appreciable N losses to the atmosphere.
5. The slow release characteristic should reduce leaching losses caused by excessive rain soon after application.

The primary disadvantages appear to be increased materials and processing cost over uncoated soluble N fertilizers, and the necessity for handling more weight because of reduced analysis. However, the value the added sulphur in S-deficient situations may compensate for this higher cost per unit of N.

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—Reprinted from
THE AGRONOMIST, Vol. 7, No. 1

SOIL AND WATER RESOURCES

Fred P. Miller

Pollution from Agricultural Fertilizers - How Serious?

Part II - Nitrogen

In 1968, American farmers applied 6.5 million tons of nitrogen to their soils. During this same year, Maryland farmers applied 40,795 tons of nitrogen out of a total commercial fertilizer material volume of 372,271 tons. But this year, Americans will consume close to nine million tons of nitrogen through the protein in their diet. This land-derived nitrogen total indicates that our annual replenishment is running considerably behind our use. If we consider the nitrogen removed from both crops and forest harvests, we are replenishing only a fraction of the nitrogen being removed annually.

Nitrogen, and especially nitrates, are receiving a great deal of attention as pollutants in the nation's waters. Many fingers have been pointed to agriculture as the culprit responsible for this situation. Some have gone so far as to raise the specter of fertilizer curtailment as a step toward environmental purification.

On most agricultural land, nitrogen is applied in quantities which seldom exceed 100-150 pounds per acre. Nitrogen uptake studies have indicated that most of the nitrogen is intercepted by plant roots and is taken up by the plant. Portions of the added nitrogen are also volatilized as well as tied up and used by soil microorganisms. And, of course, a portion does leach beyond the reach of plant roots. It is this nitrogen that concerns us here since it is the fraction which has the potential for ground water pollution.

The U. S. Public Health Service standards limit the nitrate nitrogen content in drinking water to a maximum of 10 ppm. Amounts in excess of 45 ppm are considered potentially dangerous especially when ingested by infants -- causing methemoglobinemia (blue babies).

As Dr. Cecil H. Wadleigh[1] has pointed out, however, a fallow sandy soil used in a long term lysimeter study in South Carolina released 154 pounds of nitrogen per acre over a five year period. This soil had received no nitrogen fertilizer. Similar soils in this experiment which received rather high levels of nitrogen, but were growing crops, released only a very small amount of nitrogen over the same period.

Water samples taken from tile drains under fertilized cropland in Illinois contained 5 to 17 ppm of nitrate following an application of 120 pounds of nitrogen as ammonium sulfate. The higher amounts occurred early in the season when the crop was small and were directly correlated with rainfall and flow in the drains. Van Doren et al. in Ohio recorded total nitrogen leached through tile drains to be about 3 pounds N per acre per year in a study on corn land. This amount was concluded to be insignificant.

Analysis of the nutrient contributions to Canal Lake in Ontario, Canada indicated that the greatest sources of nitrate were from the lake itself -- lake sediments, decay and release of nutrients from aquatic plants, and fixation of N in water. This lake is surrounded by a low level agricultural industry, but agriculture's contribution to Canal Lake's nutrient load was found to be very small.

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[1] Director, Soil and Water Conservation Research Division, Beltsville, Maryland.

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Analysis of several streams in agricultural watersheds in Maryland during July and August of 1969 revealed that the average nitrate content was less than 0.5 - 0.6 ppm.

Nutrient losses vary considerably and are dependent on management, soil, and climatic condition. Nitrogen applications to sandy soils are very susceptible to leaching. These soils, especially when irrigated, should be carefully managed to minimize the leaching potential.

Of course nitrogen can also be lost through erosion and runoff. It has been estimated that 500,000 tons of nitrogen are lost through erosion annually in the U.S. This figure encompasses all nitrogen sources, including that from the soil organic matter itself.

Other studies have indicated that no more than about 10 to 20 percent of the applied fertilizer nitrogen will leach from soils under cultivation, even when nitrogen applications exceed general recommendations. On most medium textured soils where good management is practiced, leaching losses of nitrogen are probably less than 10 percent.

In considering nitrogen pollution, even in agricultural areas, we must remember that nitrogen is added naturally to the environment. Nitrogen is contributed through rainfall (as much as 7 to 8 pounds per acre per year), decomposition of organic matter in soils, ground water, and wildlife. These sources, when added to the contributions from fertilizer, livestock wastes, and municipal and industrial sources, result in a very complex situation. When nitrogen data are obtained from watersheds, it must be carefully weighed before allocation of the source can be named -- especially if an agricultural watershed contains sanitary wastes from individual houses or a municipality.

Although more data and research are needed to document the significance of plant nutrients in the environment, most objective studies indicate that agricultural fertilization practices contribute only small amounts to the eutrophication of the environment. However, agriculture has a great responsibility. It is asked to feed the world with high quality products. To do this without supplemental plant nutrients is wishful thinking. Conversely, agriculture must be acutely aware of its responsibilities to the environment. There are areas for improvement. But, to suggest that plant nutrient applications by agriculture are a primary source of pollution and eutrophication cannot be substantiated by scientific evaluation.

Next month, we will examine the situation with regard to phosphorus.

Organization against oil

Country-wide machinery is now in operation to deal promptly with oil spillages around Britain's coasts and the Board of Trade recently took over responsibility for dealing with offshore oil slicks. Though we are better organized than before the *Torrey Canyon* episode, there is a need for closer coordination between the bodies involved, and for liaison with the tanker companies

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—Reprinted from
NEW SCIENTIST, Vol. 43, No. 668

Every few days, oil is washed ashore on some part of the British coast. Seabirds are killed in large numbers; commercial shellfish, though not generally killed, become tainted and are unpalatable and unmarketable for some time afterwards; fishing gear is contaminated and the catch spoiled; and amenities and the tourist industry are damaged. The major incidents and those affecting well known resorts are reported in the press and naturally there is growing public concern. This is not a new problem and much of the beach pollution is in fact trifling, but ever since the *Torrey Canyon* catastrophe, oil pollution has been more and more in the public eye and something has to be done about it.

Organization to deal with oil pollution in the south-west of England after the wreck of the *Torrey Canyon* had to be improvised for the most part, and was remarkably successful in view of the unprecedented scale of the operation. But though we were relatively lucky on that occasion there is no reason to suppose that hastily improvised measures would work in any future large-scale incident, and machinery has now been set up so that heavy oil pollution can be dealt with promptly and effectively. Since the first stage of these operations is in the hands of the coastal local authorities, the existence of a chain of command, earmarked manpower, and stocks of machinery and detergents can all help to make the treatment of even minor oiling incidents smoother and more efficient.

It can be argued that none of this should be necessary and that it would be better to cure the disease than treat the symptoms, but it looks as though oil pollution will remain a fact of life so long as industrial societies use oil and it is transported by sea. In that case it is better to be prepared for the worst that might happen. Nearly all the oil that is used in north-western Europe is transported by tanker through the Western Approaches and English Channel and these are among the most heavily trafficked sealanes in the world. Total imports of oil and petroleum products into Britain alone in 1967 amounted to 93.9 million tons, but this gives a very imperfect idea of the total seaborne traffic. Including imports, exports and coastal trade, the total movement of oil and petroleum products in and out of British ports in 1967 was over 171 million tons.

With this volume of trade, it is hardly surprising that there is oil pollution. The illegal discharge of waste oil and oily water at sea has been reduced and may be reduced still further, but it is not likely to be completely prevented unless more effective policing of offshore waters can be devised. Accidental oil spills resulting from tanker collisions and wrecks, fractured pipelines, or simple human error will probably always be with us. Accidents of this sort are in no one's interest, least of all that of the tanker companies and refineries, but it is only prudent to assume that accidents will happen and to have some means of dealing with them when they do.

In July 1968, the Ministry of Housing and Local Government and the appropriate bodies for Wales and Scotland requested local authorities to prepare schemes for dealing with oil pollution in their areas. Detailed planning has, generally speaking, been left to the Local Authorities who are best able to take into account their own special needs or interests, so that there are some minor variations from place to place. The most important step has been the setting up of a recognized chain of command with responsibility for an agreed stretch of coast. In most cases organization is at the county level, but sometimes smaller authorities have their own oil pollution schemes, or where local geography makes it sensible, there are provisions for close coordination of activities between two or more counties. The collision of two laden tankers in the Humber estuary, for example, might well engage the Kingston-upon-Hull, East Riding and Lindsey county organizations simultaneously in dealing with a major oil spill.

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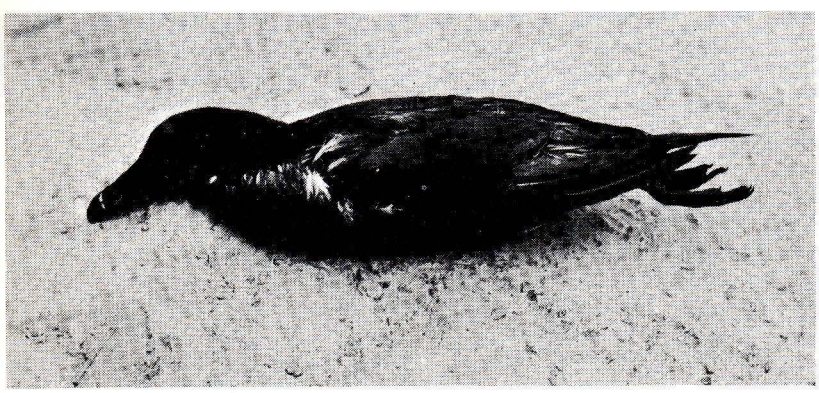
Each authority has an oil pollution officer who has control of the scheme in his area and who will also have overall direction of any cleansing operations. He may be the clerk to the county council, the county surveyor, borough engineer, county civil defence officer or similar official. Stocks of materials are accumulated or at least earmarked for use in an emergency and these range from PVC gloves and protective clothing for the operators to bulldozers and earth-moving equipment and, sometimes, fishing vessels that can be chartered if necessary. The local authorities have stocks of emulsifiers (oil spill removers or "detergents") which can be supplemented from strategically placed central depots organized by the Ministry.

The oil pollution officer and local authority employees can generally deal with small oil slicks, but in any large incident they must call on other assistance. Coastguards play an important part in giving early warning of approaching slicks. Commercial airlines and shipping may also observe oil at sea. Reports of this hazard are usually passed to the police who inform the relevant oil pollution officers. Where the treatment of beaches involves spraying with oil spill removers it is essential to wash off the emulsified oil either by spraying ahead of a rising tide or by hosing down; if hosing is necessary the local fire brigade may be called in to assist. Marine biological laboratories, laboratories of the Ministry of Agriculture, Fisheries and Food, and coastal universities with a strong interest in marine biology have also been designated and will provide scientific advice and, if need be, operational headquarters in any major incident.

In the event of a disaster on the scale of the *Torrey Canyon* the resources locally available to even a large and well prepared county council are likely to be inadequate and at this point it is possible for the oil pollution officer to call on the armed services for assistance. The Royal Air Force and Royal Navy can, of course, help at an earlier stage by reconnaissance of oil slicks at sea and the Meteorological Office, by giving detailed weather predictions for the area, is invaluable in forecasting the likely movement of oil slicks before they reach shore—floating oil travels with the wind at about 3.5 per cent of the wind speed.

One of the lessons of the cleaning-up operations after the wreck of the *Torrey Canyon* has been that, except for the loss of seabirds, crude oil does relatively little damage to marine animals and plants, but that most of the oil spill removers in use are highly toxic to marine life as well as being extremely unpleasant to handle by the men spraying the beaches. The only non-toxic oil spill remover that has been developed so far, Corexit, is effective against fresh oil floating at sea, but unfortunately less so on weathered oil and almost useless once the oil is stranded on a beach. Once it has come ashore, only the older highly toxic oil spill removers are effective in dispersing oil. Even these are not very helpful on sandy or pebble beaches —much of the emulsified oil drains into the beach and reappears weeks or months after the beach has apparently been cleaned—and it is simpler as well as more effective to remove the contaminated surface layers by bulldozing and scraping.



Rocky shores can only be cleaned with toxic oil spill removers and this causes the destruction of large numbers of animals and plants. Whatever the method adopted, removing oil after it has come ashore presents a great hazard to areas of scientific interest, nature reserves and to commercial shellfisheries. Dispersing fresh oil at sea or sinking weathered oil with suitable sinking agents (a method that is coming back into favour with the British authorities) also presents a hazard to fisheries, so that whatever scientific or commercial interests are at stake, special precautions have to be taken. The Ministry of Agriculture, Fisheries and Food and the Nature Conservancy have designated areas where oil must not be sunk or the use of oil spill removers is prohibited because of these special interests, and here, as a rule, stranded oil will be left to degrade naturally. The local district inspectors of fisheries and the regional officers of the Nature Conservancy provide the formal advisory link with the oil pollution officers.

So far as the beach cleaning operations themselves are concerned, the local authorities receive advice from the Warren Spring Laboratory of the Ministry of Technology, and a series of demonstrations of beach cleaning equipment and recommended methods of treating oily beaches is being given at various places around the coast this summer.

All these precautionary measures, and still more the beach cleaning after an oil spill, will cost the local authorities a good deal of money. At present the cost of long-term preparations and the treatment of oil spills is supported by a 50 per cent grant to the local authority from central funds, but it cannot be pretended that the burden is equally shared in all parts of the country. For minor oil pollution the financial situation is not desperate, although local authorities that suffer repeated pollution are naturally becoming restive, but in any major catastrophe additional financial help will have to be forthcoming from the central government and it has been promised that this will be considered.

Seabirds are the most numerous and most obvious casualties of oil pollution. The Royal Society for the Prevention of Cruelty to Animals is the only body with an appropriate regional organization and many of the oiled birds are brought to its officers. RSPCA has only a few centres suitable for the

treatment of oiled birds and many are collected and cared for by private individuals and local organizations. For many of the victims rescued from the beach, humane killing is the only treatment that can be given and this is best done by officers of RSPCA and the Royal Society for the Protection of Birds. All arrangements for dealing with oiled seabirds are outside the local authority schemes, although the police maintain informal contact with RSPCA inspectors. The Nature Conservancy is responsible for the overall coordination of arrangements to rescue oil-damaged birds and will provide a link with the oil pollution officers in an emergency.

So much for the preparations, but how well will they work in practice? There have been a number of minor incidents since this new organization began to emerge, but only one on a sufficient scale to offer any serious challenge to it. This was the collision of a German coaster with the tanker *Hamilton Trader* off the entrance to the Mersey on 30 April. Nearly 700 tons of fuel oil were split, threatening the north Wales resorts for a time, but after a change of wind it drifted north and eventually came ashore two weeks later on the Cumberland coast where there was severe pollution. It would be wildly unrealistic to imagine that a scheme worked out on paper could foresee all the problems that might arise and it is essential to hold post-mortems on all large incidents so that both local authorities and the central government can see where the organization can be improved. A wise man learns from his mistakes, and it would be disastrous if the first comprehensive national scheme set up to fight oil pollution became ossified, and all comment about it regarded as unwelcome criticism.

Aerial tracking problems

First, it is evident that oil slicks do not observe county boundaries; the *Hamilton Trader* oil was a hazard to the whole coast of North Wales, north-west England and south-west Scotland from Anglesey almost to the Mull of Galloway, as well as the Isle of Man. Liaison between the county organizations on the ground may be reasonably easy to arrange, but less tractable problems have emerged. Aerial reconnaissance and tracking of the oil is crucial; it was a simple matter while the oil was near air lanes and shipping routes, but as soon as it moved away from these areas, tracking became very difficult. Aerial, and to a great extent even surface, tracking of the oil is quite beyond the capabilities of local authorities. Treatment of the oil while it is fresh and still at sea is much simpler than cleaning up the mess after it has come ashore, but this, too, presents difficulties. The Ministry of Housing and Local Government instruction to the local authorities suggested that they should be prepared to treat oil slicks up to perhaps a mile offshore, but while this might be adequate on steeply shelving coasts, in shallow water it might be dangerous to fisheries to work so close to land and would probably be too late to prevent beach pollution.

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UNIVERSITY OF MASSACHUSETTS ANNUAL FINE TURF CONFERENCE

Highpoint Motor Inn — Chicopee Falls, Mass. March 4,5,6, 1970

On March 4, 5, and 6, 1970, The Massachusetts Cooperative Extension Service, The Massachusetts Turf and Lawn Grass Council, and the Golf Course Superintendents Association of New England will sponsor their annual Turf Conference at the Highpoint Motor Inn, Chicopee Falls, Mass. (Exit 5, Mass. Turnpike). The three-day event will feature lectures by some of the foremost turf authorities in the country. For information regarding registration, room reservations and meals write to:

Dr. Joseph Troll
RFD No. 2
Hadley, Massachusetts

Conference Program

WEDNESDAY, MARCH 4, 1970
General Session
Chairman: Mr. Richard Blake, President
New England Golf Course
Superintendents Association

11:00- 1:00 ***Registration***

1:00- 1:15 Welcome

1:15- 3:00 Comprehensive Regional Report on the Major Golf Turfgrass Problems for 1969
—USGA Green Section, Eastern Region
Mr. Alexander Radko, Director
Mr. A. Robert Mazur, Agronomist
Mr. James W. Timmerman, Agronomist

3:00- 3:15 Break

3:15- 4:00 Growing Turf in the Transition Zone
—Mr. George Thompson, Superintendent Columbia Golf Club

4:00- 4:45 Certification of Superintendents
—Mr. Norman W. Kramer, Vice-President Golf Course Superintendents Association of America

4:45 Massachusetts Turf and Lawn Grass Council —Membership Meeting

THURSDAY, MARCH 5, 1970
Golf Course Session
Chairman: Mr. Robert Grant, NEGCSA
Pollution

9:30-10:15 Water
—Dr. Bernard B. Berger
University of Massachusetts

10:15-11:00 Air
—Dr. Saul Rich
Connecticut Agricultural Experiment Station

11:00-11:45 Pesticides
—Dr. Robert T. Miller
DuPont Company

11:45- 1:30 Lunch

Selection, Breeding and Use of Turfgrass Varieties

1:30- 2:15 Bluegrass
—Dr. Reed Funk
Rutgers University

2:15- 3:00 Bentgrasses
—Dr. Robert W. Miller
Ohio State University

3:00- 3:15 Break

3:15- 4:00 Shade Grasses
—Dr. Glen Wood
University of Vermont (currently on leave at Washington State University)

7:00 Banquet
—Mr. Samuel H. Ramsay
Is Your Sense of Humor Showing?

THURSDAY, MARCH 5, 1970
Alternate Session
Chairman: Mr. James Rintoul, President
Massachusetts Turf and Lawn Grass Council

9:00-11:45 Pros and Cons of Bluegrass Varieties from the Commercial Standpoint
—Flyking
Mr. Doyle W. Jacklin
Jacklin Seed Co., Inc.
—Common Kentucky Bluegrass
Mr. Jacklin
—Merion Kentucky Bluegrass
Miss Margaret Herbst
Merion Bluegrass Association
—Windsor Kentucky Bluegrass
Mr. Paul Florence
O.M. Scott & Sons

11:45- 1:30 Lunch

1:30- 2:15 Interpretation of the Specialty Fertilizer Label Format
—Dr. Henry W. Indyk
Rutgers University

2:15- 3:00 Care and Maintenance of Highway Turf
—Professor John M. Zak
University of Massachusetts

3:00- 3:15 Break

3:15- 4:00 Tree Maintenance
—Prof. Gordon S. King
University of Massachusetts

FRIDAY, MARCH 6, 1970
Golf Course Session
Chairman: Mr. Thomas Curran, NEGCSA

9:15-10:00 Thatch and the Problems of Turf Maintenance
—Dr. Ralph Engle
Rutgers University

10:00-10:30 Method of Operation of Turfgrass Disease Causing Fungi
—Dr. Malcolm C. Shurtleff
University of Illinois

10:30-11:00 Nutrition and its Relation to Turfgrass Disease
—Dr. H. B. Couch
Virginia Polytechnic Institute

11:00-11:45 Control of Turfgrass Diseases
—Dr. William C. Haskett
Upjohn Company

CONFERENCE PLANNING COMMITTEE
Golf Course Superintendents
Association of New England
Leon St. Pierre
Anthony Caranci
Massachusetts Turf and
Lawn Grass Council
Charles Mruk
George Moore
University of Massachusetts
Joseph Troll, Chairman

For further information and reservations, write:
Dr. Joseph Troll
Chairman, 1970 Turf Conference
Department of Plant and Soil Sciences
Stockbridge Hall
University of Massachusetts
Amherst, Mass. 01002

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In many circumstances it would be preferable to disperse an oil slick while it is still some miles from the coast, but local authorities are generally not well placed to do this, nor will it always be clear whose responsibility it is to take this action. This problem also has financial implications. Although oil may come ashore in one place and cleaning operations be a charge on one local authority it may well be far less costly and more effective to disperse the oil at sea off the coast of a different authority whose own shores are not seriously at risk. While the development of large regional organizations—larger than we have now—may solve some of these problems, the *Hamilton Trader* incident showed that we needed to take a second look at the arrangements for aerial reconnaissance and the dispersion of oil slicks as soon as they are spotted and preferably as far offshore as possible. This has now been done.

The Board of Trade has now been given the responsibility of treating oil at sea when it is outside the range of the local authority activities. Arrangements are being made for all ships and aircraft, both civil and military, to report oil and incidents that might lead to oil pollution and the principal officers of the Board of Trade's nine Marine Survey Districts, into which British coastal waters are divided, will organize treatment of the oil slicks while they are still offshore. The Board has no facilities of its own but these officers will be able to call on the Royal Navy and other authorities for assistance.

Closer liaison needed

Second is the question of coordination between all the different bodies that may be involved in fighting oil pollution, though this is likely to improve as we gain experience and may not need special action. In an incident like the *Hamilton Trader* collision, the tanker company was among the first to learn of the accident and since it had taken place near an important oil terminal, the company was able to start cleaning operations at sea itself. It is perhaps understandable, but still a mistake, that the oil companies have not been brought firmly into the local authority schemes. There are specially equipped vessels and stocks of oil spill remover to deal with small-scale pollution at most oil terminals, and in the event of an oil spill from a known source, the company concerned takes steps to deal with it so far as it can. University departments and marine biological laboratories can also give advice and help on technical and scientific matters, but while some of them have been involved to a limited extent in advising the Nature Conservancy, it has not yet been fully realized that they may be able to assist at the local, operational level also.

The overall verdict must be that it is a good thing to have established a nation-wide scheme to deal with coastal oil pollution. Naturally enough it has teething troubles, but providing we are prepared to learn from the workings of the scheme and gradually improve it, we shall have gone a good way towards combating this nuisance on our coasts.

—Reprinted from
TURF CONFERENCE PROCEEDINGS
Purdue University, Lafayette, Indiana

PRINCIPLES FOR ANY GREEN

Wayne Morgan, Kellogg Supply Company
Wilmington, California

"How do you build a golf green?" If this question were asked of Dr. W. H. Daniel of Purdue University, he would probably first answer by in turn asking a question, "How do you build a house?" Other questions to follow would be, "What will be the condition of use?" "How much storage do you wish to build into the house?" How much money is available to build the house?"

These same questions can be related to building golf greens. Concerning the last question pertaining to costs, there is usually one of two ways this is done. The first and best approach is to determine what your requirements are, budget to meet these needs, and then build. Unfortunately, all too many turfgrass superintendents are forced to try and maintain a golf course where specifications, especially for greens and tees, are reduced to meet budget limitations. This is being "penny-wise and dollar-foolish," for building a golf course is no place to try and save money. In doing so, the conditions for use are usually much less than desirable and INCREASED maintenance costs soon more than consume any savings realized in COMPROMISED building costs.

Let us next consider each of the essential requirements that a soil must provide: support --nutrients--air--water.

Support. Not only must the soil provide a favorable medium for plant roots to grow in, the soil must also be able to withstand abusive compaction inflicted upon it, while retaining a playable surface with sufficient resistency to hold a golf shot.

Nutrients. Plants require essential nutrients which they used to help produce food and energy for their growth. The soil must provide these nutrient elements in forms available for plant absorption and in quantities sufficient to meet the plant's needs. These nutrient elements must also be present in the proper ratio, one to another for effectiveness.

Air. By air, for plant growth, what is principally referred to is the oxygen CONTENT of the soil atmosphere and the freedom of MOVEMENT of the oxygen through the soil. More important than the actual quantity of oxygen present in the soil is the speed with which it can diffuse to the roots when needed. Oxygen moves QUICKLY through air, but extremely slow through water. The higher the temperature rises, the more critical is the need for rapid movement of oxygen to plant roots.

Another consideration in soil air is the exchange of gases in the soil and surface air. Carbon dioxide in the soil can become toxic to plant roots, so there must be sufficient channels to allow oxygen to enter the soil and carbon dioxide to escape.

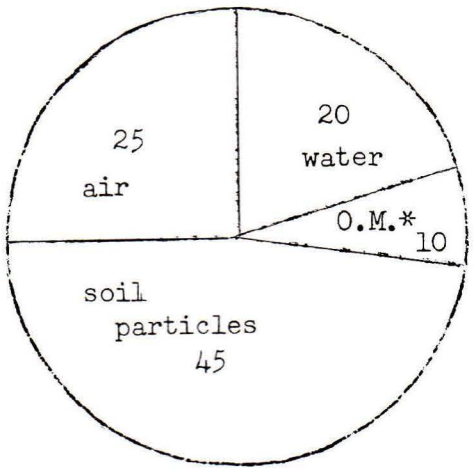
Water. The role of water in plant growth can never be underestimated. Almost all plant nutrients enter the roots in solution with water. Water movement through the plant and lost in transpiration serves as a means of cooling the plant. Many parts of the plant consist primarily of water and the metabolic processes within a plant require the presence of water. It is essential that the soil contains sufficient available water to satisfy the demand of the plant. It is also important to provide for adequate drainage of excess water from the soil.

Some information on how roots grow can next be added to aid in our understanding of the role soil plays in plant growth. Roots do not grow into soil particles - they grow in the air spaces surrounding the soil particles. As we do not enter a

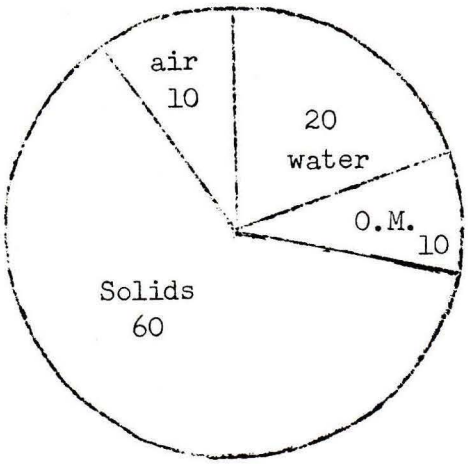
room through walls but by means of doors, there must be sufficient air channels in the soil for roots to grow in. Research has shown how root growth can be restricted by physical inpedance itself. It is these channelways that also serve for air and water movement into and through soils.

Roots do not grow where it is too dry. Neither do roots grow where it is too wet. Contrary to many popular beliefs, roots do not seek water. ROOTS ONLY GROW where there is a FAVORABLE SOIL-NUTRIENT-AIR-MOISTURE relationship.

What happens to these volume relationships can be seen from the following illustrations.



"Ideal" soil
*=organic matter



Soil compaction

---Reprinted from
TURF CONFERENCE PROCEEDINGS
Purdue University, Lafayette Indiana

AN EFFECTIVE TECHNIQUE FOR RECOGNITION

Howard Gaskill, Supt., Hiwan Country Club
Evergreen, Colorado

There have been innumerable articles written and many speeches given concerning recognition and the golf course superintendant. The subject of recognition generally involves discussion of "professionalism", public relations, and/or public image.

The Rocky Mountain chapter of the GCSAA has recently embarked upon a program of Certification that is relevant. The following is from the explanatory brochure that describes the program:

"The purpose of this program is to encourage members to upgrade themselves as well as their profession. This is to set apart those persons who are truly professional golf course superintendents. Anyone designated as a Certified Golf Superintendent will have the hallmarks of a professional.

He will possess an organized body of special knowledge which cannot be acquired except by long and difficult study.

He will be competent to practice. He will have the experience, the education, and the benefit of professional association.

He will carry his assets primarily in his head, and can practice anywhere that his services are in demand.

As a professional man he will use his talents for the public good, and will share his successful methods with others. He will be known for his good works and actions and expect to be compensated accordingly.

As a professional organization we are putting our stamp of approval on this man and saying to the public - here is a man you can be sure of when it comes to managing a golf course.

By becoming a Certified Golf Superintendent our members will be brought to the public's attention, and it is only by the attention of the public that this certification program will have any beneficial meaning."

While a superintendent's duties may vary from course to course, certain basic qualifications can be singled out as essential:

1. He must have adequate knowledge of types and varieties of turfgrass and the know-how, as well as basic information to produce the desired result.
2. He must know where to obtain specific information relating to all phases of his operation.
3. He must be able to supervise and work intelligently with his employees.
4. He must have integrity, for the club's property is under his supervision
5. He must be able to maintain good records covering everything from budgets to weather reports.
6. He must be able to make decisions in the face of complex problems.
7. He must have tact and diplomacy in dealing with members, guests and club officials.

A candidate for certification must be presently employed as a golf course superintendent and must have accumulated 200 points based on his experience, education and association activity.

Points are awarded according to the following scale:

1. Experience points (70 points minimum requirement):
   A. Assistant superintendent, working under a Class A or certified superintendent. Points can be earned for a maximum of three years and are based on the size of the golf course.

Number of full years	18 holes or less	More than 18 holes
1	5	10
2	10	20
3	15	30

   B. Superintendent. Points are also based on the size of the golf course.

Years	Less than 18 holes	18 holes	More than 18 holes
1	10	20	30
2	20	30	40
3	30	40	50
4	40	50	60
5	50	60	70
6	60	70	80

   etc.
   C. Golf Course Construction. Additional points may be earned by experience in golf course construction. To qualify, construction experience must cover all phases of construction, from rough-grading through seed germination. 15 points for each regulation 9 holes; 10 points for each 9 hole par-3 course.

2. Education points (50 points minimum requirement):
   A. Full school year attendance at college:
      Agriculture major 15/year
      Other major 10/year

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B.	Degree(s) following college	5 each
C.	Approved turf winter school	10 "
D.	GCSAA Turfgrass conference	5 "
E.	Regional or state turf conferences	5 "

c. Association activity (15 points minimum requirement)

A.	GCSAA membership	1/year
B.	Chapter meetings (max. of 6/year)	1 each
C.	Chapter office holder	1/year
D.	GCSAA office holder	5/year

I would like to encourage all superintendents present at this Conference to review the point-award system that will be printed in the Proceedings. The Rocky Mountain GCSA has not limited their certification program to members of their chapter. Any superintendent in the GCSAA who feels that he meets the requirements may write to:

Larry Eggleston, Chairman
Certification Committee, RMGCSA
c/o Broadmoor Golf Course
Colorado Spring, Colorado

A $ 15.00 application fee will be charged. The explanatory brochure and application form will be mailed out. When a superintendent is certified he will receive a Certificate of Certification and press releases will be mailed to his local newspaper, the industry journals and magazines. Because of the generous amount of newspaper space this new program has received, I encourage other GCSA chapters to start similar programs and to work for a National Certification program from the GCSAA.

Reprinted from
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TEN YEARS OF DECISIONS

James W. Brandt, Supt., Danville Country Club,
Danville, Illinois

It would be grossly unfair if I delved into the decisions that I and the Board of Directors have made at the Danville Country Club over the past few years without giving due credit to my predecessor at the Danville Country Club, Mr. Alan Wyman. I inherited Washington bentgreens that were in excellent condition and entirely free of Poa annua. Fairways had an excellent stand of Common bluegrass. Tees were also bluegrass, but became too small with the greatly increased play.

When I arrived in Danville in March, 1953, Danville had just begun to experience a rapid industrial growth, with a resultant increase in new golfing members. This coincided with a demand for general improvements in teeing areas and effective sand traps on the golf course. The budget for the year had been set at $ 25,000.00. My first inventory included:

1 1937 Ford Tractor in excellent condition
1 1940 Farmall B Tractor with row crop front and equipped with sycle bar
1 Avery Tractor with single front wheel and hand-operated brakes
1 1947 International half ton pickup truck
2 Fairway gang mowing units - tractor drawn 1 5-gang, 1 7-gang
1 set of 5-gang rough mowers
1 150 gallon spray rig with well-rusted tank
Adequate greens mowers
No tee mowing equipment - fairway units were used to mow tees and borders of greens

Watering system. 6 lengths of hose, 6 Buckner sprinklers with roller stands. During summer months of 1953 two men besides myself hand-watered greens starting at 4:30 in the evening and lasting until 11:00 at night. One man had to walk a 90 ft. embankment and manually start a centrifugal pump. The booster pump was then started in the basement of the club house. Water came from two artesian wells. This also served as the club house water supply.

The work shop consisted of a 10 x 30 work area in the club house and basement. The greens mowers were kept in this area and were let down and taken out of the basement on a skid board up and down the 12 steps. It is necessary to give you this background in order that you might know the problems confronting us in our decision making in order to bring the course and equipment up to the point that we are now considered to have one of the better-equipped and conditioned courses in the area.

I placed water and irrigation equipment as the number one item for consideration for improvement. Fairway watering could not be considered, but adequate water for greens and tees was number one priority. A new well was drilled. This well supplied 250 gallons per minute. Additional hose and sprinklers were purchased. Now one man could water in less than four hours, watering 10 greens at one setting. This savings in labor the first season in use more than paid for the $ 2,200.00 cost of well, plus donated pump.

There was an abundance of plantain and dandelions in the fairways and roughs. The sprayer had so much rust and corrosion that it was impossible to use the spray boom. The first season the tractor with the sycle bar was used primarily for mowing the spikes off the buckhorn. A new spray unit was bought in the spring of 1954. We discarded the sycle bar for weed control.

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In the first five years the budget was increased from $ 25,000 to $ 27,000. Yet with this minimal increase in budgets we were able to buy new spray equipment, a new truck with dump hoist, replace the two tractors with tractors more adaptable for golf course maintenance. We also were able to fertilize fairways for the first time in the history of Danville Country Club. The same year we bought 2 bushels of Zoysia sprigs at a cost of $ 50.00. These were planted in rows in the nursery.

We had excellent fairways in 1957 - that is until crabgrass took over. At a Board of Directors meeting I was asked if something could be done about the crabgrass problem. This was the first time I had been asked to make any sort of improvement on the golf course. In 1957, at the Fall Field Days at Purdue, we saw some excellent crabgrass control using the arsenicals. Encouraged by these results, I tried my first major selling job to the membership. We put out 10 plots in March of 1958. At the heighth of the crabgrass invasion these plots were posted with signs giving the treatment and cost per acre. After seeing the results, the membership demanded that the control measures be put into effect. In March, 1959, 435 lbs. 85% tri-calcium arsenate was applied per acre. Crabgrass and chickweed control have been outstanding since the initiation of the program. We have been able to maintain our toxic level of calcium arsenate by using 100 lbs. per acre on alternate years.

Meanwhile, back in the nursery the Zoysia had made complete coverage of the initial area planted. Two tees were sodded to Zoysia. The player acceptance was overwhelming. Since that time we have converted all tees, with the exception of #15, which is in complete shade. A mixture of bent and Poa has held up very well on this tee. All tees, with the exception of 3 tees, have been doubled in size in the past 10 years. All of the Zoysia used on the tees has been developed from the original 2 bushels.

The sand traps had been a great source of complaints from the better golfers. Each one had a long, grassy slope extending from the edge of the trap bottom to the edge of the green. It was decided to bring in fill at the edge of one green and make an incline of 4 feet with a good sharp lip facing the golfer. This brought a demand that all traps around greens be treated in this manner. The terrain around 12 of the greens made it possible to make good effective traps. This was accomplished over a 4 year period.

In the spring of 1964 I was faced with another major decision. Upon returning from this Conference in 1964, I was called into the Board of Directors meeting. I was asked if I would assume the duties of manager, as well as being the golf course superintendent. This was a most difficult decision to make as I had been tended an offer to become golf course superintendent at a very outstanding midwestern club.

I must admit that I very much like Danville as a town. Although my salary had been generous, the budget left much to be desired. Here was truly a great challenge. The Club had operated at a deficit for some five years at the rate of some $ 5,000 per year. My most compelling thought was that if I could just get the Club on a sound financial basis, then I could get a much-needed watering system for the fairways. As most of you know, I did stay.

Net income per year -

1964	$ 3,694	loss
1965	15,762	profit
1966	29,412	
1967	17,012	
1968	11,681	

These profits were realized without any increase in membership dues or assessments. The former excise tax was used for capital improvements rather than operating income. At the end of each year the net profit was transferred into the capital improvement.

With the Club again on a sound financial basis, the Board of Directors in 1966 decided that we should consider the irrigation of the fairways. Again we were faced with an inadequate water supply. My recommendation was to dam up a large ravine and use this as a storage basin. The Board of Directors decided to hire an engineering firm specializing in water supply studies. The engineering firm made a feasibility study, finding that our aquafier was adequate to withstand continuous pumping. They were then asked to design and supervise the construction of a reservoir. They advertised for bids, the savings in the bid price over a member quoted price more than paid for the total engineering fee of some $ 2,800.

The Board also decided to hire a firm to design and procure bids for the irrigation system. Mr. Austin Miller was the designer of the original system. The bidding firms were asked to bid on both completely automatic systems, and a system with automatic greens and tees, and manual fairway watering. Kirchdorfer Irrigation Company was awarded the contract for a completely automatic system. They submitted an alternate bid on a two-row system as opposed to a single row system. The price was only $ 2,000 more for the double row system.

I had made a preliminary survey of superintendents who had used automatic and manual systems, and superintendents who only had used manual systems. Every one of the 6 superintendents having automatic systems said they would never go back to a manual system and gave supporting reasons. These letters, as well as my very strong convictions, convinced the Board to go all the way with the automatic system. Three of the four men that I contacted,who did not have automatic systems and said they would not want to go with the automatic systems, are now converting their courses to automatic systems.

At the Board meeting that the watering system was to be voted upon, I brought along these few slides for their viewing. The vote was unanimous to budget $ 120,000 for a lake and the automatic irrigation system. The actual total cost of the system was $ 102,000 of which the lake cost $ 13,000, and engineering services $ 3,800.

Now we have ample mowing equipment, including a 7-gang push-type mower, tee mowers, bunker mowers, apron mowers - all riding equipment. We have a completely automatic irrigation system, a new heated 40 x 50 ft. work area, superintendent's office; in fact, now our real need is some good workmen to operate all of the fine equipment.

In 1964 when I took over the dual-role at the Club, the grounds budget was $ 39,000. In 1969 the grounds budget will be $ 55,000.

Decisions - yes, we all must make many decisions. Yet, every decision should be one that can be substantiated by the need whether it be improved playing conditions, results of inflation, or other need. Sell your decisions to yourself, then your chairman, then the Board, and finally the membership. Lay the ground work carefully and every club member will think that it was his decision. You will then have made the membership happy as well as accomplishing your desired goal.

FROM

MASSACHUSETTS TURF AND LAWN GRASS COUNCIL INCORPORATED

RFD #2, HADLEY, MASS. 01035

Join Your Massachusetts Turf And Lawn Grass Council

For more information write:

Mass. Turf and Lawn Grass Council
attn.: Dr. Joseph Troll
RFD #2, Hadley, Mass., 01035
or
George Moore, President MTLGC
1295 State St., Springfield, Mass.

The Massachusetts Turf and Lawn Grass Council is a non-profit corporation. Its officers derive no benefits except the satisfaction of keeping Massachusetts and its neighbors first in turf. It was founded on the principle of "Better Turf Through Research and Education." We must support our University to accomplish this, and we can with a large and strong Turf Council.

Membership is not restricted to Massachusetts residents or turf professionals alone, all are welcome to take part. Write today.